ACFAP Quarterly

American College of Foot and Ankle Pediatrics

Fall 2017

http://www.acfap.org

ACFAP
American College of Foot and Ankle Pediatrics

The American College of Foot & Ankle Pediatrics is excited and proud to announce its 3rd Annual ACFAP Pediatric Foot & Ankle Seminar. The Seminar will take place at Snake River Lodge & Spa, Jackson Hole WY, May 31-June 2, 2018.

This CME event will feature leading authorities on pediatric foot & ankle conditions. It will cover topics ranging from pediatric H&P, flatfoot, equinus, sports medicine, surgery, and rotational conditions. The meeting will be preceded on Thursday May 31 by a one day national park excursion.

Featured at this meeting will be spectacular Grand Tetons National Park.

At the Conclusion of this meeting, the attendee shall be able to:

- Develop effective Protocols for treating the pediatric patient.
- Effectively evaluate surgical vs. non-surgical options for many common Pediatric foot & ankle pathologies.
- Improve patient outcomes in the pediatric patient for common conditions such as flatfeet, juvenile HAV, and Equinus.

For Conference details or to register online: please go to acfap.org/events.html

Seeking 12 CE Contact Hours

No commercial interest provided financial support for this continuing education activity

Lecture Schedule

Friday June 1

7:00-7:45 am	**Registration, Breakfast & Visit Exhibitors**
7:45-8:00 am	**Louis J. DeCaro, DPM** Welcome Address
8:00-8:40 am	**Dock Dockery, DPM** Pediatric Dermatology & Warts!
8:40-9:20 am	**Roberta Nole, MA, PT, Cped** Flatfoot & Forefoot Posting in the Pediatric Patient
9:20-10:00 am	**John Grady, DPM** Pediatric Tarsal Coalitions
10:00-10:40 am	**Break & Visit Exhibitors**
10:40-11:20 am	**Mitzi Williams, DPM** Pediatric Digital Deformities
11:20-12:00 pm	**Ed Harris, DPM** The Pediatric Cavus Foot
12:00-12:40 pm	**Theresa Ruggiero,** Do Your Patients Feet Need Eyeglasses?
12:40-1:40 pm	**Lunch & Visit Exhibitors**
1:40-2:40 pm	**Harold van Bosse, MD & Kaye Wilkins, MD** Pediatric Fractures
2:40-3:20 pm	**Emily Splichal, DPM** The Importance of Sensory Stimulation in Pediatric Development

Lecture Schedule (cont.)

Friday June 1 (cont.)

3:20-4:00 pm	**Break & Visit Exhibitors**
4:00-4:40 pm	**Patrick Deheer, DPM** Pediatric Equinus
4:40-5:20 pm	**Al Armstrong, DPM** Pediatric Radiology
5:20-6:00 pm	**Nicholas Pagano, DPM** Pediatric Sports Injuries & Gait/Foot Abnormalities
6:00-6:20 pm	**All Speakers** Q&A

In the event of cancellation ACFAP is unable to assume risk or responsability for the exhibitor's and/or registrants time or expenses should an act of God, government action, disaster, weather or other force beyond ACFAP's control make it inadvisable or impossible to conduct this event. The exhibitor and/or registrant may wish to consider purchasing personal travel insurance to insure their expenses.

Not an ACFAP Member?

Becoming a member of ACFAP for $150 instantly saves $150 off the conference registration fee

Go to acfap.org/membership.html

Lecture Schedule (cont.)

Saturday June 2

7:00-7:45 am	**Breakfast & Visit Exhibitors**
7:45-8:30 am	**Marc Benard, DPM** Pediatric Humanitarian Missions (non-CME)
8:30-10:30 am	**Harold van Bosse, MD & Kaye Wilkins, MD** Clubfoot Lecture & Workshop
10:30-11:15 am	**Break & Visit Exhibitors**
11:15-11:45 am	**Louis DeCaro, DPM** Marketing (non-CME)
11:45-12:45 am	**All Speakers** Pediatric Speed Pearls (non-CME)
12:45-1:45pm	**Lunch & Visit Exhibitors**
1:45-2:30 pm	**Roberta Nole, MA, PT, CPed** Pediatric Gait Video Analysis
2:30-3:15 pm	**Phil Bresnahan, DPM** Arthroereisis Workshop
3:15-4:15 pm **T**	**Tracey Toback, DPM & Patrick Agnew, DPM** Measuring the Child Workshop

This conference is intended for podiatric physicians and other medical specialties dealing with the pediatric lower extremity. No prerequisite levels of skill, knowledge, or experience required of learners.

This activity has been planned and implemented in accordance with the standards and requirements for approval of providers of continuing education in podiatric medicine through a joint provider agreement between the William L. Goldfarb Foundation as a provider of continuing education in podiatric medicine. The William L. Goldfarb Foundation will be seeking approval this activity for a maximum of 12 continuing education contact hours.

ACFAP
American College of Foot and Ankle Pediatrics

is proud to present the

4th Annual

ACFAP
INTERNATIONAL PEDIATRIC FOOT & ANKLE SEMINAR

to be held at

Grand Tetons National Park
Snake River Lodge & Spa
Jackson Hole, WY

ACFAP
American College of Foot and Ankle Pediatrics

Member Sign-up/Renewal 2018

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Practice Name: _____

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The fee for membership in ACFAP is $150 for 2018

Please remit this amount to:
ACFAP c/o Dr. Louis J. DeCaro
10 West Street, Unit 7
West Hatfield, MA 01088

Or renew online and pay with credit card at acfap.org/membership.html

PLEASE WRITE YOUR EMAIL ADDRESS ON YOUR CHECK!

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Asst.Design Editor; Sara Gromada

Presidents Message

"The highest calling of any doctor is to prevent what they treat."
- Unknown

Hello fellow ACFAP members! I love that quote, don't you? I believe our primary focus as physicians is to heal, but also we must never lose site of our obligation to prevent and foster successful early intervention.

2017 has been a banner year for ACFAP in many ways. Looking forward I see 2018 as adding to our successes!

Recently ACFAP was represented at APMA National, the annual AAPSM in Chicago, and the Iowa and New Mexico state society meetings. We have conducted screenings at events such as the Down syndrome buddy walk. Upcoming, ACFAP will be present for a ½ day track at AAPPM in Atlanta, and SAM 2018.

ACFAP 2018 Annual Scientific Meeting will be here before you know it! We are continuing the National Park "tradition" at the Snake River Resort & Spa in Jackson Hole, WY, May 31 – June 2, 2018. Once again we will precede the meeting with a group outing in the Grand Tetons National Park on May 31st. Back by popular demand we have once again lined up professional photographer and tour guide, Mr. Don Toothaker (toothakerphoto.com) who has conducted expeditions in the Grand Tetons over 10 times.

The scientific part of the conference will take place in Jackson Hole, WY on Friday and Saturday June 1-2, 2018. This CME (12 CME's) event will feature leading authorities on pediatric foot and ankle conditions. It will cover topics both conservative and surgical. As well the seminar will feature new and exciting panels and workshops. There will be all new topics including radiology, dermatology, vision assessment, and the importance of sensory stimulation. We will have a variety of speakers including DPM's, MD's, OD's and PT's. Workshops and panels will include Clubfoot casting, practice management, how to guides to "measuring" the pediatric patient, and hands on surgical arthroereisis. Please go to our website acfap.org for more information.

I am also excited to announce an incentive program for discounts to ACFAP 2018. Help ACFAP sign up new members, and for each referral get $25 off your seminar registration. Sign up 14 members and get free registration! It's that easy! Full details are included inside this issue.

Our meetings are designed to educate, innovate, and build tremendous camaraderie within our membership. An overall experience unparalleled in the podiatric world.
The "Can't Miss" meetings of the year, located in one of those "Can't Miss" spots!

I want to again welcome all past, future, and current members of the American College of Foot and Ankle pediatrics to this new era not only in this organization, but also in the education of pediatric foot and ankle medicine. Thank you to each and every one of you for making this all possible!

Louis J. DeCaro, DPM
President, ACFAP
www.acfap.org

ACFAP
American College of Foot and Ankle Pediatrics

ACFAP Member Bonus!

Find any non-member to sign up as a new ACFAP member (and they mention you as their referral source)...

and get $25 off your registration to the ACFAP 2018 Conference. **$25 PER MEMBER** you help sign up!

Limit is 14 referrals ($350) or the equivalent of a free conference registration.

It's easy. Copy the new member registration form in this newsletter or have your friend or associate go to acap.org, have them sign up, and mention you're the reason!

Offer expires December 31, 2017

Case Report: Metatarsus Adductus and Internal Tibial Torsion in a 2 week old Female

Arianna Sabghir, DPM

Abstract

Congenital lower extremity torsional in infants may present at birth. Metatarsus adductus and internal tibial torsion are two common examples, with internal tibial torsion making up 27% of in-toe pathology[1] and metatarsus adductus occurring in 1:1000 live births[3]. These congenital deformities are both the result of genetic influence, but are otherwise not related. They may present independently or in combination.

This case reports a 2 week old female with a congenital complex deformity of severe metatarsus adductus with internal tibial torsion of the right side, with a lesser presentation on the contralateral limb. Conservative treatment for correction of both deformities was accomplished though soft tissue manipulation, serial casting and bracing. Correction was maintained using orthotic devices. A 3.5 year follow-up showed complete, maintained correction of metatarsus adductus bilaterally with slight residual right lower extremity internal tibial torsion managed with gait plate UCBL orthotics.

Introduction

Congenital deformities of the lower extremity may begin as a result of fetal intrauterine modelling secondary to local pressures . Metatarsus adductus and internal tibial torsion are common congenital pediatric foot deformities, which occur independently. Ponseti studied congenital metatarsus adductus in fetuses at 16 and 19 weeks of gestation and found developmental abnormality of the medial cuneiform as a pathogenic factor leading to deformity . The incidence of congenital metatarsus adductus is 1:1000 live births . A literature search for congenital, severe internal tibial torsion revealed limited publications as congenital tibial torsion is rarely an isolated complaint in the infant. One study specifically looked at 99 infants with lower limb torsional deviations and found that internal tibial torsion represented the largest single category at 27%, followed by increased femoral anteversion, and external tibial torsion[1]. This study also reported a 40% association between metatarsus adductus and internal tibial torsion in the newborn with a statistically significant poorer prognosis for spontaneous improvement.

Metatarsus adductus is a deformity at the Lisfranc joint which causes soft tissue contractures around the joint, resulting in a C-shaped foot with a convex lateral border and prominent styloid process. This presents as an adducted forefoot relative to a neutral hindfoot. The clinical features are adduction and various degrees of supination of the forefoot, often associated with mild valgus angulation of the heel and internal tibial torsion . Metatarsus adductus is classified by using Bleck's Test to evaluate the location of the heel- bisector line. A normal, bisector line crosses between the second and third toes. Mild, crosses through the third toe and moderate, crosses between the third and fourth toes, or through the fourth toe. Severe, crosses between fourth and fifth toes . According to the literature, the degree of flexibility does not correlate with outcome prediction post treatment.

Internal tibial torsion is measured by utilizing the thigh-foot angle directed internally . The child is positioned prone and the angle formed by a line bisecting the foot and a line bisecting the thigh is measured. Greater than 15 degrees internally rotated after the age of eight is abnormal[6]. In infants, this measurement can range from -30 degrees internal rotation to +20 degrees external rotation but should average zero to -10 degrees internal in childhood. It is not measured on a "mild, moderate, severe" scale.

Initial recommended for treatment for both deformities includes passive stretching until 4-6 months of age with routine monitoring for improvement. 11-14% of cases are persistent and require more aggressive treatment with serial casting or special bracing to avoid the need for surgical correction[3], . Katz, who studied 99 infants with lower extremity torsional deviations, found that a little more than half still had the tibial torsion by 6 months of age. The remainder

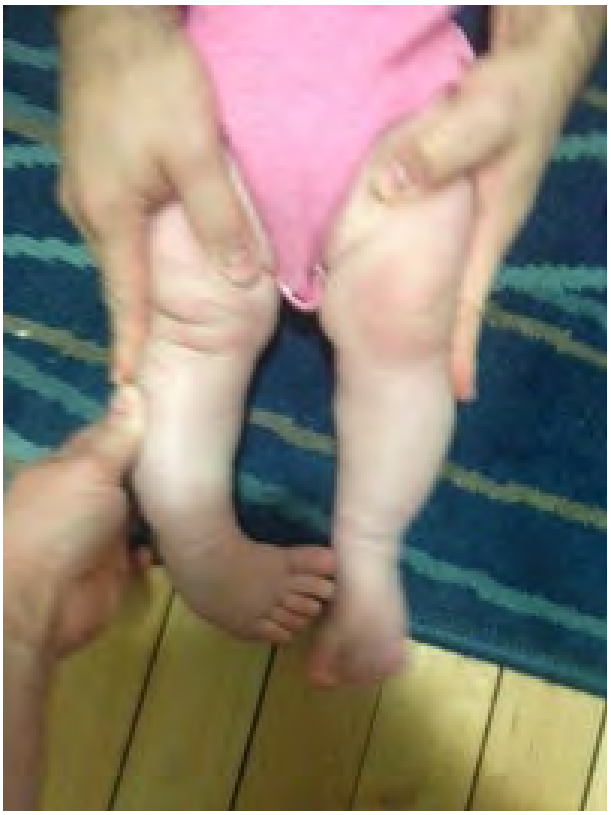

Figure 1: Infant at initial presentation with gross right foot forefoot adduction, c-shaped foot and an internally rotated foot on leg. A similar, lesser presentation can be appreciated on the left foot.

Figure 2: This photograph shows the initial above-knee cast application with appropriate hand placement to maintain correction as the plaster dries.

of infants showed spontaneous improvement with no need for further treatment. Within the same study, the group which failed to resolve spontaneously showed metatarsus adductus in association with bilateral internal tibial torsion[1]. A case is presented here of a child having both of these deformities simultaneously.

Case Report

A two (2) week old female was presented by her parents with concern for a severe internal position of the baby's right foot. A similar, but milder presentation was observed in the left foot. The newborn was born full term, uncomplicated pregnancy and delivery and had no known medical problems. Upon initial presentation, the forefoot was adducted on the hindfoot and the entire foot was positioned in a flexible varus attitude (Figure 1). There was no plantarflextory component to the deformity and the entire deformity was reducible. The MA deformity was severe according the Bleck's Test and significant Internal Tibial Torsion was noted at greater than -30 degrees internal rotation on the left. Treatment involved home stretching techniques and re-examine in a few months.

At 3 months of age, the baby presented with no change in the degree of clinical deformity. No noticeable correction was noted despite consistent home stretching. The deformities were still reducible. Treatment was altered to serial casting (Figure 2). The soft tissue contractures in the foot were stretched for 15-20 minutes prior to the start of casting. The right lower extremity was placed in an above knee cast that was changed bi-weekly. The casts were removed at home by the parents the night before the next cast was applied. During this time, home stretching techniques were utilized for the left lower extremity as the deformity was mild. After 3 months, the casting process was complete and the MA deformity was completely reduced bilaterally. During this time, 2 cast applications were also applied to the left lower extremity to aid in correction.

The child was then placed in a Dobbs Brace with open toed, straight last shoes which were worn 23 hours each day for 2 months (Figure 3). This

Figure 3: This photograph shows the patient in the Dobbs brace with a pair of straight last shoes. The Dobbs brace allowed for motion in the sagittal and frontal planes while holding the foot in the corrected abducted position on the transverse plane.

was followed by wearing reverse last shoes and brace for sleep, while in the stroller, or sitting in the high chair until 18 months of age. At that point, the child stopped tolerating the brace at night time and was walking independently. She wore closed toe reverse last shoes until age 3 when she was fitted for a pair of custom foot orthotics with gait plate extensions.

The patient achieved full correction of her metatarsus adductus with no relapse at her 3.5 year follow up (Figure 4 and 5). The internal tibial torsion is still present and appears moderate to severe in a gait exam without her orthotics. While using in-shoe orthotics, which include gait plates, her gait was rectus and she no longer tripped over her own feet. At this time, she will continue conservative management.

Discussion

Conservative treatment for metatarsus adductus and internal tibial torsion is recommended by most authors[5]. This involves passive stretching until 4-6 months of age, followed by serial plaster casting. It is important to remember that the combined deformity, as seen with this infant, is less likely to resolve spontaneously and will require a more involved treatment plan. While passive stretching in the flexible infant with isolated mild deformity may result in spontaneous correction, cases of combina-

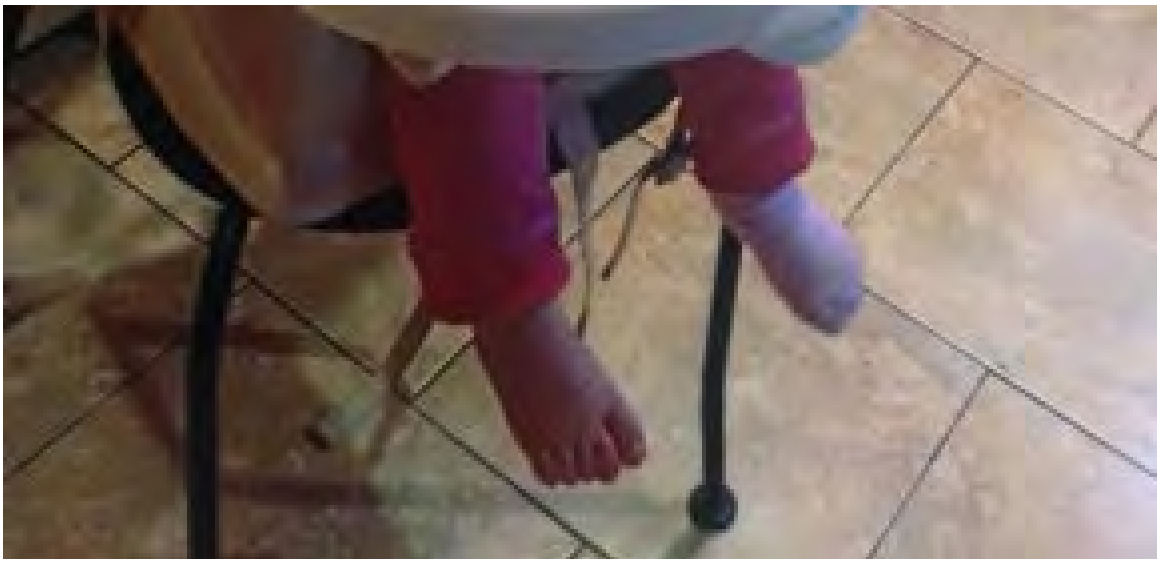

Figure 4: Figure 4. Off weight bearing complete correction of metatarsus adductus deformity at age 2

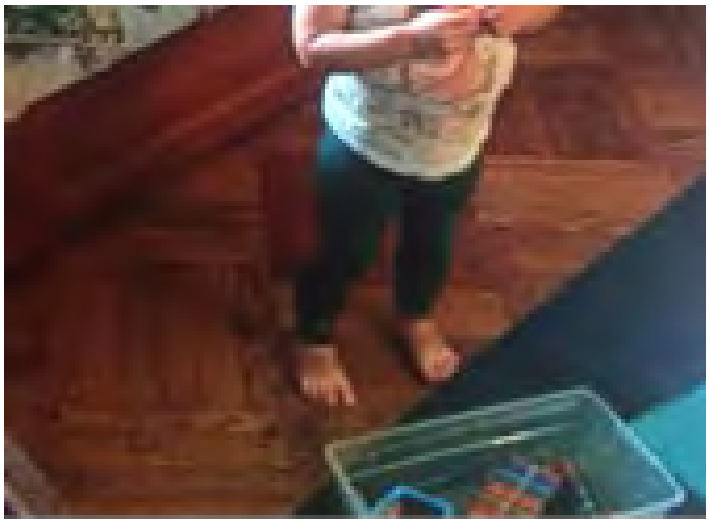

Figure 5. Weight bearing photograph showing complete correction of metatarsus adductus deformity at age 3.5

tion deformity are less likely to respond to this treatment alone. Often times, serial casting, straight or reverse last shoe modifications and Dennis-Browne Bar or Dobbs Brace type therapy augmentations are required to achieve adequate correction.

The influencing factors contributing to the deformity, such as intra uterine position, genetic predisposition, ligamentous laxity or spasticity as well as the degree of deformity and its flexibility/rigidity must be recognized when considering the treatment. This case was complicated by the significant internal tibial torsion deformity in addition to the severe metatarsus adductus compounding the adducted appearance and in-toe gait. The treatment protocol utilized was sufficient to completely correct the metatarsus adductus. As this child ages, her internal tibial torsion should continue to improve spontaneously, although there is no way to predict if it will correct completely.

References

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Arianna Sabghir, DPM is in Private Practice on the Upper West Side in New York City. She specializes in podopediatrics, sports and dance medicine.

Setting up your Pediatric Practice

Sadaf Balouch D.Ch, IIWCC

Building your own practice comes with many challenges and rewards. I have enjoyed building my own practice as a Foot Specialist and I am proud to say that I am the only registered clinician in Brantford Ontario and surrounding cities with a podopediatric sub-specialty. We are a very busy podiatry practice with the goal of saving limbs and lives.

My interest in Pediatrics started while studying podiatric medicine at the Michener Institute in Toronto, Ontario. Unfortunately, there was only one course on podo pediatrics and after finishing it, I never felt fully confident to treat children's feet. When I started practicing, I referred my most challenging patients out to another foot specialist at a nearby city. I felt awkward telling my patients that I could not tend to their children's foot problems and it was very inconvenient for a lot of them to go out of town for an appointment. This is when I decided that I am going to look up for courses and conferences to brush up on my knowledge and to gain more skills.

It took some time to find the correct resources, textbooks and videos that I could refer to but things started to come together. Attending the podo pediatrics seminar in Bar Harbour in June this year was the last of what I needed to be fully confident to turn my practice around to what interested me the most. After returning from the seminar, we had a detailed staff meeting. My team and I had a plan, and we were ready to rock it. And trust me we are still rocking it!!!

My team and I have come up with a few suggestions that I feel will be helpful in your journey to building your pediatric practice. We have designed brochures and posters that are bright and colourful, and contains age appropriate photos. I schedule luncheons with pediatricians, pharmacies and Family Physicians' offices to discuss my practice and these brochures have proven to be very helpful. Posters are also displayed in my treatment rooms to arouse interest in my patients while they wait. My secretary hands out brochures at the front desk to promote a special that we offer for our pediatric patient's initial visit.

Additionally, she includes these brochures when she prepares patient's reports, which are mailed out to family physicians. We also deliver the brochures to physicians who are already referring patients, to make them aware of this new specialty. We have also ensured that all my patients who are parents, grand-parents, teachers, physicians, stay-at-home moms…basically everybody, know basic information about children's foot care. We have small topics like: pigeon toeing, walking on tip toes, plantar warts, tired/fatigue legs, toe issues in children etc, that we brush up on when we start a conversation with a patient. My clinical assistant is also trained to bring up these topics. There is always someone who knows someone who knows a child that has similar issues. This is when we give them more details and a brochure for the consultation appointment. All these above are extremely useful but basically costless efforts that you can put in your office.

We did also have our fair amount of challenges along the way. For example, those who see the brochures and posters may think that we only specialize in pediatric patients and we could lose out on po-

tential adult patients. Another challenge we faced is with parents who feel that their children may outgrow their condition and that there is no need to see a doctor. I also think that people are so used to having our provincial government pay for medical services that they may not like the fact that this service isn't one of them. In this case you can let them know that most secondary insurance companies do cover chiropody treatments/products. Many things can be overcome, you just need some perseverance. Most patients/parents who are properly educated about a condition, a service or a product, will be likely to go above and beyond to help their child or their children's future. Be genuine with your exam findings and concerns and treatments, and trust me your patients will appreciate it. They will find a way to cover the cost of the treatment because it is their children that you are talking about, and you have educated them about the importance of this treatment.

Always remember that on your journey there will be several obstacles that you may face, but the rewards will always outweigh them. If you have a strong interest towards podo pediatrics and you would like to build up your pediatric practice, you don't have to have big budget to do so. All you need is interest, motivation, simple ideas like what I have shared above, as well as determination. I hope this article will help you have a successful pediatric practice.

The Importance of Treating Feet in Children with Down syndrome

Louis J. DeCaro, DPM

The Responsibility of the Pediatric Podiatrist

The goal of any practitioner, no matter what their specialty, should be to better the lives of their patients using every tool available to them without bias. As podiatric physicians we have the unique ability to use all forms of medicine, including surgery, on our patients. It is my belief that a well-rounded podiatrist should be someone who recognizes the implications of foot ailments at the earliest of ages in order to prevent adult problems. That is why I have chosen to specialize in podopediatrics.

The feet are the foundation of the body, and from the first step a child takes, deficiencies in the lower extremity begin to create a destructive domino effect on the rest of the human body. It is our job as podiatrists to make sure the feet are taken care of. Whether a child has a simple or complicated medical history, their feet should be screened and treated like those of anyone else. Children with the diagnosis of Down syndrome are no exception.

"Normal" Development of the Pediatric Foot

Let's talk about what should occur with foot maturation of any child regardless of other medical diagnoses. At the age of 2 years old, the heel bone should sit at about 4 degrees or so everted (means that when you look from the back of someone the heel bone looks like its collapsing down and in.) From 2 years old until 6 years old the "normal foot" should lose about 1 degree of the "eversion" per year and at the age of 6 the heel should stand somewhat "straight up." This allows an arch to be present. The foot support is on the outside, bringing the center of gravity to a more neutral stance. Another phenomenon that is "supposed to happen" as we grow older from the age of 0-6/7 is that our lower leg bones start to turn out, and we get a more erect stance. For a majority of those with Down syndrome these two "normal" processes do not occur adequately.

The Down syndrome patient

In a patient diagnosed with Down syndrome, there are a multitude of concerns which may be present involving the heart, digestive system, spine, eyes, intellect, joints and mobility. Individuals with Down syndrome typically have problems with collagen, which is the major protein that makes up ligaments, tendons, cartilage, bone and the support structure of the skin. This creates significant laxity from the feet up, thus beginning at a young age the life long destruction of the kinetic chain. "Almost all of the conditions that affect the bones and joints of people with Down syndrome arise from the abnormal collagen found in Down syndrome."[1] The resulting effect in 88% of the Down syndrome population is hypotonia, ligamentous laxity and/or hyper-mobility of the joints.[2] The combination of this ligamentous laxity and low muscle tone contribute to orthopedic problems in people with Down syndrome.

Within the feet, the most common foot problems which can be found in the Down syndrome patient are "digital deformities, hallux abducto valgus, pes plano valgus, metatarsus primus adductus, hyper mobile 1st ray, brachymetatarsia, haglunds' deformity, syndactaly and Tailors bunion."[2] Genu valgus and subluxation and/or dislocation of the patella are another concern due to this condition. Hip and spinal issues are often seen as well.[1]

Overall laxity of the feet has been reported in 88% of children with Down syndrome.[3] This percentage is far higher than those without, yet what I see is that often their feet are ignored. The primary medical diagnosis seems to trump the importance of good foot health. I'm here to say it should not. All medical issues should be addressed.

Specifically the feet

Many patients with Down syndrome have flat feet due to laxity, which we know will not cure itself. We need to screen for this early. This troubling flexible flat foot can be spotted at a

FIGURE 1: A patient of Dr. DeCaro's successfully completing a climb to the top of a mountain for the first time utilizing the correct foot support. Functional orthoses can significantly increase the active lifestyle of a child diagnosed with Down syndrome.

very young age. Unlike many children though, this flat presentation does not go away by the age of 3 but continues causing foundational destruction to the rest of the body as the years go on.

What I have seen with my young Down syndrome patients is an inability of the heel bone to come out of eversion. When that happens the arch, the ankle, and inevitably the rest of the body stay flat and become "dragged down" toward the midline. This causes many kids with DS to have trouble sustaining good strength when they stand and building good core musculature. This "collapse" will impair normal external rotation of some long bones of the body, which leads to multiple postural changes. As well, when physical therapy is called upon to strengthen the child, failure or delay of achieving a strong kinetic chain is inevitable. You can't build on a poor foundation! Not only will the structure not support it, but due to poor foot alignment the muscles during the exercises may not even fire.

Quality of life factors for Down syndrome patients

According to Benoit, "when a person has limited ability for movement, there is bound to be some restriction in exposure to learning opportunities and social stimulation, and this privation tends to be reflected in depressed intellectual ability."[4] In other words, by allowing the patient to be more mobile, the patient's overall well being will be increased. This is critical since those with Down syndrome are living twice as long as they were 25 years ago.[5] In fact, studies have shown that those with Down syndrome live longer when they have developed good self-help skills.[6] What better way to encourage self-help than to enable a patient to walk, run and be physically active over the course of a lifetime? It is a known fact that with Down syndrome comes an increased incidence of Alzheimer's disease. With that typically comes an increase in proteins called Amyloids. Researchers at Washington University in St. Louis found that there was a correlation between a sedentary lifestyle and a higher level of amyloid deposition.[7] Thus, the science is once again telling us that inactivity can lead to an early demise.

Obesity is also common in Down syndrome patients, partially due to inactivity. By correcting the biomechanics, inactivity may be lessened and quality of life may be increased. (FIGURE 1)

Treating the pediatric foot

As a pediatric specialist, now with 11 years of experience, what I find troubling is that identifying problem feet at an early age is non-existent in the medical community. This is especially true in those with Down syndrome. Not only are the feet typically last to be looked at but also being that there can be a plethora of other ailments, the feet get little notice. I try to base my practice on the simple fact that "feet are feet!" A person's foot type is their foot type no matter what medical condition they may or may not have. Unbeknownst to them, many practitioners fall guilty of not recognizing and treating important issues like flat feet when they become

focused on what they deem "larger problems." I have made it a personal mission of mine to get out to groups across the country, such as parental Down syndrome support groups, pediatricians, fellow podiatrists, Early Intervention specialists, PT's and OT's and various other specialists, and lecture on the importance of recognizing the feet and its association of their improvement with improved quality of life.

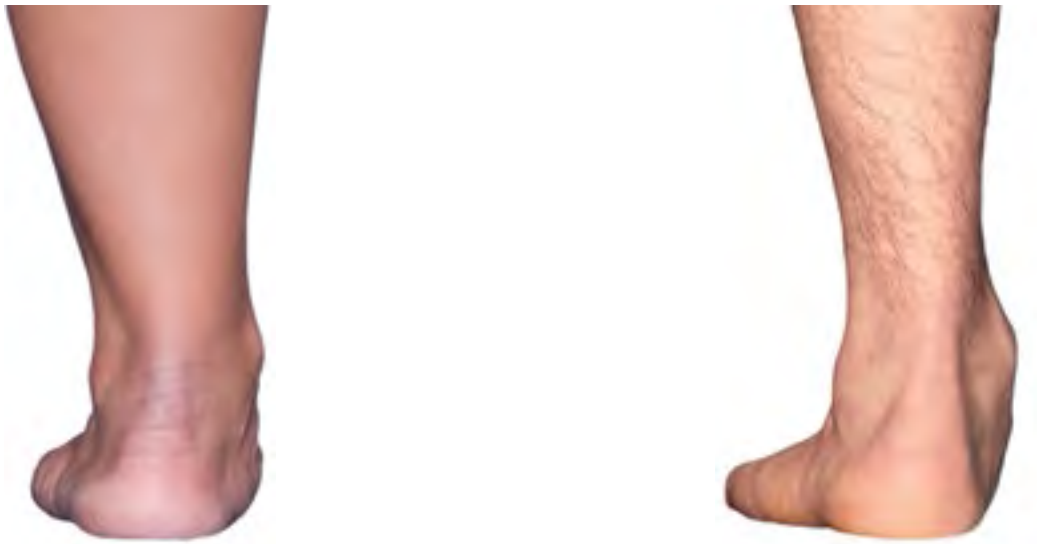
Most common foot types in Down syndrome

There are six major categories of foot types (www.whatsmyfoottype.com) in the adult population, each becoming apparent as early as age 6 or 7. When a podiatrist treats a patient with Down syndrome, whether an adult or a child, the biomechanics of the feet and lower extremities need to be analyzed closely and each patient needs to be foot typed. Frequently, patients with Down syndrome have a D foot type with a neutral to mildly compensated rearfoot and a neutral forefoot. As the child matures to adulthood, this foot type can often progress to an F foot type where the heel rotates even more, causing the person to strike the heel on the inside. This creates more collapse of the subtalar joint, which pulls the entire medial side of the kinetic chain downward resulting in genu valgus, knee torsion, and greater hip rotation. This is a very inefficient foot type causing early fatigue and muscle pain. (FIGURE 2) It's like every step the child takes is in quick sand. Let's quickly review the specifics of these two common foot types.

The **D Quad Foot Type** is a moderately over-pronated foot-type. This foot-type occurs when a Compensated Rearfoot Varus exists with a normal or neutral forefoot alignment. This foot-type is congenitally a partially unstable foot and is often diagnosed in children as developmental flat foot. Make no mistake, if you think that this child will "out-grow the deformity," just ask their biological parents, grandparents and older siblings to take off their shoes and socks. If family members demonstrate similar foot characteristics, chances are that this child is not going to develop an arch. During gait, this foot begins to pronate at the subtalar joint in contact phase, and continues to pronate throughout midstance. In propulsion, the 1st ray will plantarflex to load the medial column of the foot and allow the foot to re-supinate.

The **F Quad Foot Type** is commonly referred to as a Pes Planovalgus foot deformity because of its very poor alignment to the floor. This is a true "flat foot." The condition occurs when a Compensated Rearfoot Varus is coupled with a large Flexible Forefoot Varus (also called Forefoot Supinatus).This foot type is the most hypermobile or flexible of the foot-types. This hypermobility leads to great instability throughout the foot and ankle, and can be prevalent throughout the body. These feet look "very flat" at an early age and can only worsen into adulthood. This severe instability also makes it difficult to develop and maintain core strength throughout

FIGURE 2: Typical foot type in those with Down syndrome pictured left to right: The D foot type (neutral forefoot with compensated rearfoot) The F foot type (rigid forefoot varus with compensated rearfoot) courtesy of www.whatsmyfoottype.com



the legs and trunk. Muscles need to work "overtime" to do the same job as someone with better functioning feet, drastically increasing energy expenditure. This foot-type causes a lot of damage to the forefoot during propulsion. In addition to transverse metatarsal arch reversal, don't be surprised to see hammertoes, hallux abductovalgus deformity, functional hallux limitus, and painful corns and calluses.

Effects of the D & F foot (of those with Down syndrome) on the Kinetic Chain

Let's start with the knee. Len Leshin, MD, FAAP writes, "Instability of the patella (kneecap) has been estimated to occur in close to 20 percent of people with DS. The majority of cases of instability present only as kneecaps that can be moved further to the outside than the normal kneecap (subluxation); however, some people can have their kneecaps completely move out of position (dislocation), and some may even have a hard time getting it back into the right position. Mild subluxation of the kneecap is not associated with pain, but dislocation may be painful. While people with instability of the patella are able to walk, there is often a decreased range of motion of the knee, with an accompanying change in gait. The longer that nothing is done for the instability, the worse the condition will get over time. Orthoses (special braces) may be useful for mild cases, but severe cases require surgical correction." [1]

Next up the chain comes the hip. Leshin continues, "Five to eight percent of children with DS will develop abnormalities of the hip. The most common condition is dislocation of the hip, which is also called subluxation. In this condition, the head of the thigh bone (the femur) moves out of the socket formed by the pelvis (the acetabulum). This dislocation may or may not be associated with malformation of the acetabulum. The dislocation appears to be due to a combination of laxity of the connective tissue that normally keeps the hip together along with the low muscle tone found in DS. Interestingly, hip subluxation in children with Down syndrome is hardly ever found at birth but instead is most common between the ages of 3 and 13 years. The most common sign is a limp, and pain may or may not be present. Treatment will often start with immobilization of the hip with a cast. Many children with DS will require surgical correction, however."[1]

And finally we hit the back. Leshin adds, "Another condition associated with the spine in Down syndrome is scoliosis, which is the curvature of the spine to the side. While it appears to be more common in people with DS, the exact incidence isn't known.…Treatment of scoliosis remains the same as in other children, with bracing being the initial therapy, followed by surgical intervention if necessary."[1]

The overall plan

Orthoses need to be specifically designed to improve coordination, balance, pain, posture, and strength, and to aid in the development of a more stable and functional gait. These orthoses should be comprised of a deep heel cup, a medial heel skive, and high medial and lateral sidewall flanges. (FIGURE 3) Control of the subtalar joint is paramount. Often kids are over-braced with AFO's due to lack of foot control. By providing adequate foot control, SMO's and AFO's are often times not necessary. I find many children who are "over-braced" lack necessary joint movements and muscle development vital for normal growth and maturity.

Complementary solutions to Early Biomechanical Support

Physical Therapy progress typically associated with Down syndrome motor development is slow; and instead of walking by 12 to 14 months as other children do, children with Down syndrome usually learn to walk between 15 to 36 months. Specific physical therapy recommendations to consider, along with inserts/orthotics/SMO's, include: "Strengthening of lower extremity musculature (hips, knees, ankles, and feet) aimed at improving push off and augmenting support of the knee joint. Heel cord stretching with the heel in neutral alignment when limited passive range of motion exists. Lastly, Dynamic balance activities, such as running or descending stairs, which encourage the child to shift their weight during late swing phase rather than waiting until heel contact." [8] These are very good recommendations. I, along with many therapists in my area of practice, am seeing that when orthotic inserts are prescribed along with physical therapy, the improvement really sticks and builds. I see children in therapy all the time that have these everted/flat feet who just either never or too slowly build on strength absent there orthotics. Building better foundation helps those muscles move along faster.

FIGURE 3: A functional UCB type orthotic, with a high medial and lateral sidewall flanges, such as littleSTEPS, combined with supportive footwear, can be highly effective for the typically flexible foot of a young child with Down Syndrome.

Getting the Ds patient to make an appointment

But to treat a Down syndrome patient, you have to see them. That is where the education piece is so critical. In many of our communities, we have Early Intervention services for babies born prematurely or with medical concerns. This can be the place where an initial referral can originate. When an EI therapist understands the importance of the feet and biomechanics in the development of any child, she/he can screen for this. With early intervention, Down syndrome patients can have a better outcome in meeting their developmental milestones and lessening their risks of Alzheimer's and obesity.

In Summary

So what can you do to help? As podiatrists, we are in the unique position of being trusted medical professionals of the lower extremity and its effects on the kinetic chain. This gives us the ability to get out and educate, educate, educate. Preparing the community of people who work with the Down syndrome patients is the key to getting these clients proper foot care early in life in order to allow them a better chance at a long, healthy, active existence. "Treatment of painful feet in patients with Down syndrome is imperative because foot pain leads to relative immobilization and immobile retarded adults do not remain long in the community."[9] My goal as a practitioner and someone who recognizes the progression of foot types is preventing pain by knowing how to deal with it before it happens, coupled with improving overall biomechanical strength and structure. No matter a child's medical diagnosis, it is important to educate parents and their children what their "foot type" is, and what that may bring them during their adult years. Please feel free to reference my websites www.whatsmyfoottype.com and http://www.decaropodiatry.com for additional information regarding my practice and its methodologies.

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Podopediatric Exam – The Infant and Toddler

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Examination of the infant or toddler follows the same basic format as the adult physical examination but need proceed with consideration of development and what constitute normal findings for a particular stage of development. For example, a child first starting to walk need widen stance and increase the angle of gait. As such, the presence of in-toeing at that stage is never normal. Symmetry of position, shape, muscle development is expected so unilateral changes are reasons for further investigation.

A podopediatric practice focus does not necessarily mean decorating one's office for children but it is important to make children comfortable with the examination.

- Young children may associate a doctors office visit with pain due to immunizations and we readily let children know that "we do not give shots here."
- Consider not wearing a white coat to a pediatric exam even if you wear such in adult exams.
- Much of the infant or toddler exams I perform is with the child sitting on their parent's lap. Occasionally, children may act out in the presence of parents and the exam can be performed with parents not present. Smile and greet children, approaching them as a friend.
- Initiate the exam with questioning and observation of stance and gait, leaving the hands on portion toward the end of the examination. Palpate the area of suspected pain or pathology last.
- Inform the parents if the child was not sufficiently cooperative to complete the exam and reschedule if needed.

The basic history and physical format follows:

Patient ID

Chief Concern – The reason for seeking care. Signs and symptoms and their duration. This information is obtained from the parents or legal guardians and may be supplemented with medical records from the pediatrician. Adults can, with a reasonable degree of accuracy, describe symptoms with regards to location and quality (eg, sharp pain, dull ache). Infants, toddlers and young children often cannot readily locate areas of pain, let alone describe its quality. Ask parents to be observant. Does the child hold or rub a body part? Limping or changes in gait? Tripping of falling? Does the child avoid certain activities?

History of Present Illness – PQRST

Provocative/palliative – What activity, position, activities seem to exacerbate or mitigate the concerns.

Quality/quantity – Children often cannot express the amount of pain or quality of pain accurately. Take caution not to underestimate pain in the child due to a lack of verbal expression.

Region/location – A child can often point to the area of pain or discomfort but ask parents to relate their observations of the child's behavior with respect to the concern.

Severity – Is the pain constant or intermittent.

Timing – Onset of pain or symptoms. Duration of pain or symptoms.

PMH – Past medical history and past surgical history. Include questions that may relate to musculoskeletal issues of the lower extremity such as difficulties at birth, intrauterine position, breach birth.

ALLERGIES

MEDS – Both prescription meds, OTC meds. Supplements.

SOCIAL HISTORY – Age of the child precludes issues such as ETOH an tobacco but questions should be extended to the parents or guardians with respect to tobacco use in the home and potential safety issues that may affect the child.

FAMILY HISTORY

REVIEW OF SYSTEMS

OBJECTIVE – The scope of the physical exam need be broad enough to assess potential causes of gait issues. The standard foot and ankle exam used for adults need be performed in addition to hip and knee exam as well as a focused neurologic examination. Findings such as in-toeing

and out-toeing involve a complete assessment of axial positions and motion of the lower extremity as well as assessments of muscle strength and appropriate reflexes.

NEUROLOGIC EXAM AND REFLEXES OF THE INFANT

The standard neurologic exam used in adults is supplemented in the infant by examination of developmental reflexes or primitive reflexes.[1]

- **Plantar Foot/Grasp Reflex** – Apply light pressure to the distal plantar aspect of the foot. The response is flexion and adduction of the toes. The reflex can be elicited from birth and disappears between 9 to 12 months age. Absence or decreased toe flexion is seen in flaccid paralysis and it's persistence may indicate delayed development or a spastic condition of the lower extremity.
- **Placing reaction or reflex** – Hold the infant upright by the torso with the head facing away from you. Approach the exam table with the child allowing the dorsum of the foot or anterior leg to gently touch the edge of the table. The infant will lift the legs up to place them on the table by flexing the hip and knee and dorsiflexing the foot. This reflex is present at birth and can persist up to one year. No importance is placed on persistence but absence can indicate neurologic dysfunction.
- **Walking or stepping reflex** – Hold the infant upright by the torso with mild forward lean, touching the bottoms of the feet to the exam table while slowly moving forward. The response is alternating leg movement simulating walking. This reflex is present at birth and disappears after two months of age. Absence may indicate flaccid paralysis while persistence may indicate neurologic dysfunction.
- **Crossed extension reflex or Philippson reflex** – The infant is supine on the exam table and both hips and knees are extended. Lift one leg, keeping the knee extended, then stroke the sole with your hand in a fashion similar to performing a Babinski maneuver. The contralateral hip/leg will abduct and flex followed by adduction and extension simulating an attempt to push away from the simulus. Present from birth through 2 months.
- **Positive Support Response/Leg Straightening Reflex** – The infant is held upright then lowered to the exam table several times allowing the soles to touch the top of the table. The knees should go into extension. It is present from birth through 4 months. Persistence of this reflex may interfere with development of reciprocal leg movement and walking.

FOOT EXAMINATION

Look for symmetry, shape. Metatarsus **adductus** is one of the more common findings at birth. It involves structural adduction of the metatarsals at Lisfranc's joint and may include a varus component. It has been termed, "one third of a
clubfoot" (talipes equinovarus) in that it does not include ankle equinus or forefoot varus rotation. Talipes equinovarus is often noted at childbirth and actively treated while, metatarsus adductus, due to it's lessor severity may remain untreated.
Metatarsus adductus should be treated early, preferably soon after birth as treatment at that stage is relatively simple and non-invasive. Manipulation or serial casting is effective in the infant. If metatarsus adductus is left untreated or improperly treated, the deformity will become a fixed, rigid deformity leading to increased lateral forefoot pressure with potential lateral column pathology and compensatory subtalar joint pronation. Metatarsus adductus can also be a component of in-toeing in the child in addition to causes such as internal tibial torsion and femoral ante-version. By the time the child starts to walk, casting and manipulation may be ineffective. Use of an AFO at night may be effective in reducing metatarsus adductus.

An old "treatment" for metatarsus adductus involved reversing shoe wear, that is, placing the left shoe on the right foot and the right shoe on the left foot. That treatment often appeared to work but it worked for the wrong reason. Reversal of shoe-wear would abduct the forefoot at the point of least resistance, the midtarsal joint. Abduction of the midtarsal joint is not an acceptable treatment for metatarsus adductus despite what appears to be visual improvement. Flattening of the medial longitudinal arch and excessive pronation of the rearfoot can be a consequence of midtarsal joint abduction. It is possible for midtarsal joint adaptation via abduction to occur gradually over time in response to untreated metatarsus adductus leading parents to believe that the child "outgrew" the

deformity. The term "skewfoot" or "Z-foot" refers to a pedal deformity in which there is metatarsus adductus present (or talipes equinovarus residua) but compensatory forefoot abduction at the midtarsal joint and subtalar joint pronation. Treatment of the Z-foot includes a prescription orthotic designed to reduce subtalar joint pronation via a deep heel cup with a varus post plus medial heel skive, medial and lateral flanges placed to reduce midtarsal joint abduction and often a forefoot valgus post designed to reduce varus rotation at the forefoot. Parents need be warned that there may be a visual increase in the metatarsus adductus due to the reduction of compensatory midtarsal joint abduction. Surgical treatment of metatarsus adductus may be required depending on severity.

Clubfoot is often discovered and treated at birth. The most common type of clubfoot is talipes equinovarus. There are four components of talipes equinovarus: equinus, varus, adductus and pes cavus. Early conservative treatment involves manipulation and casting. If such conservative treatments are not completely effective, they will significantly lessen the deformity such that the degree of potential surgical intervention is lessened. Intrauterine position and developmental delays are included in the list of causes but the presence of clubfoot should raise suspicion for neurologic issues such as spina bifida, cerebral palsy, myelomeningocele.

FLATFOOT

Flatfoot is an entity that involves a degree of confusion and controversy because the term is used broadly to describe a foot with the appearance of a low arch. Occasionally, it can be dismissed as "normal" due to the fact that infants have a fat pad in the arch that create the appearance of a low arch. It is important to differentiate a normal foot that appears to have a low arch from actual pathology.

Arch height need be observed both in non-weight bearing and during weight bearing. It is a sagital plane measurement influenced by the calcaneal inclination angle, metatarsal declination angle as well as the shape of the lessor tarsus. A "normal" flat foot is a foot in which there is a low calcaneal inclination angle (calcaneal pitch), low metatarsal declination angle and, in which, the joints of the tarsus are congruent. Pathologic flatfoot or pes valgo planus occurs when there is a lack of joint congruency in the rearfoot, particularly the talocalcaneal joint and talonavicular joint. Currently, more accurate descriptions have been offered such as "medial talo-tarsal dislocation" or talo-tarsal instability. Severity of pathology is proportional to the degree of talo-tarsal dislocation in gait. The term "subluxation" refers to a partial dislocation but, for political reasons, has been avoided due to prejudicial coverage issues by third party payors in the US. Medial subtalar joint instability can occur in patients with relatively high arches when examined non-weight bearing.

Flexible pes valgo planus is somewhat more difficult to diagnose before the infant walks as it is generally observed during the weight bearing process. Subtalar joint pronation, which involves adduction and plantarflexion of the talus on the calcaneus and eversion of the calcaneus is a normal response to weight bearing pressure occurring during the contact phase of gait and to the internal rotation of the leg during early contact phase. Subtalar joint pronation that is excessive or that persists, in the gait cycle, beyond midstance phase is pathologic. Signs such as calcaneal eversion (everted calcaneal stance position) or a positive Helbings sign (inward bowing of the Achilles tendon in stance) are consistent with medial subtalar joint instability. Use of foot orthotics such as the UCBL type, soon after the infant starts to walk can yield good results and prevent or mitigate adult symptomatology in my experience. The paucity of long term studies in this area should not discourage treatment as there is considerable experiential evidence.

It is unlikely that a toddler will complain of pain while learning to walk. Parents should look for delayed onset of walking, feet that appear to "roll over," calf cramps, feet that "turn outward."

Look for two related entities when examining the flexible flatfoot: ligamentous laxity and functional equinus (lack of adequate ankle dorsiflexion). Equinus or functional equinus may also be compensated for by excessive subtalar joint pronation if the toddler brings the heel to the ground in gait or by toe walking. Ligamentous laxity or hypermobility may occur as a normal variant or due to genetic disease states such as Marfan's syndrome or Trisomy 21.

Rigid deformities, that is, a foot that displays a fixed position of eversion and depression of the medial longitudinal arch may be due to talipes calcaneovalgus type flatfoot, tarsal coalition, congenital vertical talus. Such deformities

may be "semi-rigid" in a young infant and still amenable to mitigation by manipulation and casting. Early diagnosis and treatment are essential.

Talipes calcaneovalgus may be due to abnormal in utero position of the foot such that the plantar aspect of the foot is dorsiflexed up against the uterine wall. The foot is dorsiflexed against the ankle, the forefoot abducted and the heel is in valgus. Manipulation exercises and casting, applied soon after birth, is effective and residual deformity can be treated via a customized AFO. The Wheaton Brace TM is a customizable thermoplastic AFO that can be utilized for this deformity as well as the residua of talipes equinovarus and metatarsus adductus.

Vertical talus involves rigid or semi-rigid plantarflexion of the talus with dorsal dislocation of the talonavicular joint. There is a visual rocker bottom deformity due to the plantar prominence of the head of the talus. This entity is also termed "congenital convex pes valgus." Etiologies may include arthrogryposis, a combination of arthrogryposis and intrauterine malposition. There have been cases of autosomal dominant transmission of the deformity. This is a structural deformity but it's presence should trigger a neurologic exam and/or consult. Potential neurologic and genetic associations and concerns include myelomeningocele, spinal muscular atrophy, spasm/contracture of tibialis anterior and, less commonly Trisomy 13-15 and 18, neurofibromatosis and congenital hip dislocation.[2]

CAVUS DEFORMITY OR PES CAVUS

Cavus foot type refers to a high arch foot but when arch height is excessive or there is associated gait difficulty, it may be considered a deformity. Varus angulation of the calcaneus and valgus frontal plane forefoot rotation are often seen with the cavus foot and may be termed a cavovarus deformity. Additional adduction of the forefoot may be noted and can exacerbate intoeing.[3] It has been suggested that neuromuscular disease is frequently concomitant.[4]

GAIT EXAMINATION AND INTOEING

The two issues are combined as a full examination of the causes of in-toeing presupposes a thorough gait exam. The gait cycle as studied in the adult applies to children. The pediatric gait exam may be weighted toward parameters such as **angle of gait**, **base of gait**, **cadence** and **stride length**, particularly when we are looking for common "axial" concerns such as in-toeing and out-toeing. A infant becomes a toddler upon starting to walk. The word "toddle" is defined, "to walk with short, unsteady steps." [5]

Parents may be concerned about the time their child starts to walk. The range of normal is broad, about 9 to 15 months. No parental training is needed to quicken the onset of walking. Babies may "cruise" which involves the child holding onto an object such as the rails of a playpen to become upright and moving laterally, move about the walls of a room for support and eventually attempt forward walking with assistance. Stability is improved by widening the stance and angle of gait so out-toeing at this stage is normal development but never in-toeing. Adequate muscular, neurologic development and joint stability should exist which is why wheeled walking devices are discouraged.

Stride length is the sum of the distance of both left and right step lengths. Step length can be different from left to right. Cadence relates to the speed of strides. A toddler will have a shortened stride and increased cadence. A longer stride requires balance and stability. A cause for shortened stride can be equinus or functional equinus. Observation of shortened stride in conjunction with midstance subtalar overpronation may be related to functional equinus. A normal angle of gait may be 0 to 15 degrees external with some allowance for additional external angulation in the new walker.

In-toeing that persists can lead to loss of stability in gait, falling/tripping and reduced participation in sports. In-toeing cannot be "outgrown" but appears to reduce over time and development as the child matures and is able to consciously point the feet straight. It is my experience that the ability to actively change gait, including angle of gait and stride length occurs between the ages of 4 and 5. Children may reach a stage mistakenly termed the "clumsy" stage. The ability to maintain the forward angle of gait reduces with sports participation and fatigue so tripping occurs as the child becomes too tired to maintain the feet in the straight position.

Causes of in-toeing include metatarsus adductus, metatarsus primus adductus, internal tibial torsion, talipes equinovarus residua, femoral antetorsion, femoral anteversion, and congenital dislocatable hip. There is some confusion over the means by which the literature defines the entities "femoral anteversion/retroversion"

and "femoral antertorsion/retrotorsion" and would like to suggest a simpler and more precise terminology to describe axial deformities.

Internal femoral rotation: This refers to entities such as tight internal rotator muscles of the hip or tight pubofemoral ligaments that cause excessive internal rotation of the femoral segment in gait and may be a component of in-toed gait. This is a soft tissue issue that is reducible and correctable via exercise, stretching as well physical/manual therapy. There is a bicycle for toddlers known as the "Big Wheel" in which the child pedals in a position that is mildly inclined and with the hips externally rotated. Use of this device has been helpful in the treatment of internal femoral rotation. Internal rotation is primarily induced and maintained at the level of the hip so examination and treatment of the hip is relevant. **External femoral rotation** converse malady in that there is no deformity of the femur but external rotation in gait is induced/maintained by weak internal hip rotator muscles and abductors of the hip. Ligamentous restriction of internal femoral movement is less likely.

Internal femoral torsion and external femoral torsion: This refers to a true torsional deformity of the femur occurring within the shaft of the femur. If severe, surgical correction via a derotational osteotomy is required. It cannot be corrected via exercise and therapy although, if mild, can be compensated for by treatment of co-existing components of in-toeing. For example, if a child with in-toeing has internal femoral rotation, internal femoral torsion, and internal tibial torsion then two of the three can be readily treated via conservative means: night splint, Wheaton BraceTM, or Tibial TransformerTM applied during sleep and rest to treat the internal tibial torsion and physical therapy to treat the internal tibial rotation.

Determination of axial deformity.

1. Lateral foot border. Convexity will occur with metatarsus adductus.
2. Observe the position of the knees in gait. The hip advances and the femoral segment internally rotates during heel strike through the midstance phase of gait. Excessive internal deflection of the knee/kneecap is associated with internal femoral torsion or internal femoral position.
3. Rotate the leg/thigh externally and internally while the knee and hip is straight. One is not measuring absolute degrees of motion but the relative difference between internal rotation and external rotation, the ratio. The ratio may vary from external rotation:internal rotation at 3:2 to 1:1. The presence of more internal axial or rotational motion than external may indicate and internal axial issue of the femur or hip.
4. Bend the knee and hip to about 90 degrees and rotate the leg/thigh externally and internally. The ligaments of the hip are relaxed at this position. Compare the ratios of axial rotation to those obtained with the hip straight. If, for example, there is a 2:3 ratio of internal to external femoral motion observed with the hip straight but it reduces to 1:1 with the hip flexed, then one is observing internal femoral rotation. If there is no change in femoral rotation movement with the hips flexed, in this example, then one is likely dealing with a true internal femoral torsion.
5. Malloelar position. The lateral malleolus is positioned posterior to the medial malleolus when the leg is in the transverse plane. Observe the front of the leg with the kneecap facing the ceiling (child laying supine on the exam table) or better yet, the tibial tuberosity facing the ceiling. Note the position of the malleoli by running axis through the malleoli and the angle made with the tibial tuberosity. The range of normal is approximately 15 to 25 degrees external. A malleolar position of, say, 10 degrees would be consistent with internal tibial torsion.

Treatment of the infant with internal tibial torsion may be treated with loosely wrapped long legs casts in which the knee is flexed and the cast cut circumstantially and progressively rotated externally. Similar treatment can be performed with the Wheaton BraceTM , Dennis Browne splint/bar, Unibar, Pediatric Counter-Rotation System™ and Ganley Splint™. The traditional Dennis Browne splint is a simple straight bar that is either clamped or nailed onto the sole of an open oxford type shoe. It does not protect the knee with flexion as the Wheaton Brace can. One simple modification is to bend the bar downward a few degrees in the middle which places the foot into mild varus potentially reducing abductory moment at the midfoot. It is not likely that it can treat internal femoral torsion/rotation as the torsion moment may be

transmitted to the knee joint. Availability may be limited on the Counter-Rotation System and Ganley splint. The Wheaton Brace involves two components, the lower section fits over the foot and leg, focusing on metatarsus adductus while the upper section is placed over the bent knee and articulates with the lower section with velcro. The lower section can be progressively rotated outward on the upper for treatment of internal tibial torsion.

Use of serial casting ceases as the baby reaches the age of standing and cruising. The Wheaton Brace and Dennis Browne type splints can be utilized until about the age of 3.

LIMB LENGTH DISCREPANCY

Limb length discrepancies are measured and often viewed as a static deformity in adults and after epiphyseal growth closure. Such discrepancies need be viewed dynamically in the growing child. Look for asymmetries in gait to include hip drop in contact phase (a hip drop in swing phase may be due to weak abductors on the contralateral side – Trendelenburg sign), shoulder drop as well as early heel off on the potentially short side.[6] Test all lower extremity muscle groups to look for selective areas of weakness. Measure both lower extremities from the anterior superior iliac spine to the tip of the lateral malleolus. It is often not necessary to determine leg length discrepancies at precise numbers because treatment using lifts can be imprecise but a CT scanogram can be helpful when there is disagreement among clinicians as to the amount and location of limb length deficiency.[7]

TOE WALKING

So-called idiopathic toe walking is often a perplexing problem to clinicians. It is thought to represent a habit of the toddler that will eventually be outgrown. Once causes such as muscular dystrophy or other neurologic disorders are ruled out one must consider why a child would chose such a habit. Deformities such as equinus, a pathologically short heel cord not allowing the heel to touch the ground, are often discovered while entities such as functional equinus go under the radar screen. Proper measurement of ankle dorsiflexion need be performed with the subtalar joint in neutral as the action of actively dorsiflexing a foot with restricted ankle dorsiflexion will display dorsiflexion at the subtalar joint as a component of pronation. Normal gait requires that the ankle allow approximately 10 to 15 degrees of dorsiflexion before heel off and a lack of such is considered functional equinus. Compensatory subtalar joint pronation may be associated with pain or increased effort in propulsion leading to the toddler to elect toe walking. The majority of "idiopathic" toe walkers I see in my practice display functional equinus. Treatment is focuses primarily on manual therapy to increase ankle dorsiflexion range of motion and gait training. If the child has been toe walking for a number of years, the addition of an AFO designed with a posterior strut which irritates the back of the ankle when toe walking is attempted and break the habit portion of the cycle may be added. Typically such AFOs need be used for 4 to 6 months.

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ASK THE PANEL

Send Questions to: ljdacfap@gmail.com
Look for answers from a panel of experts in future issues as well as by email


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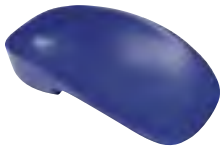

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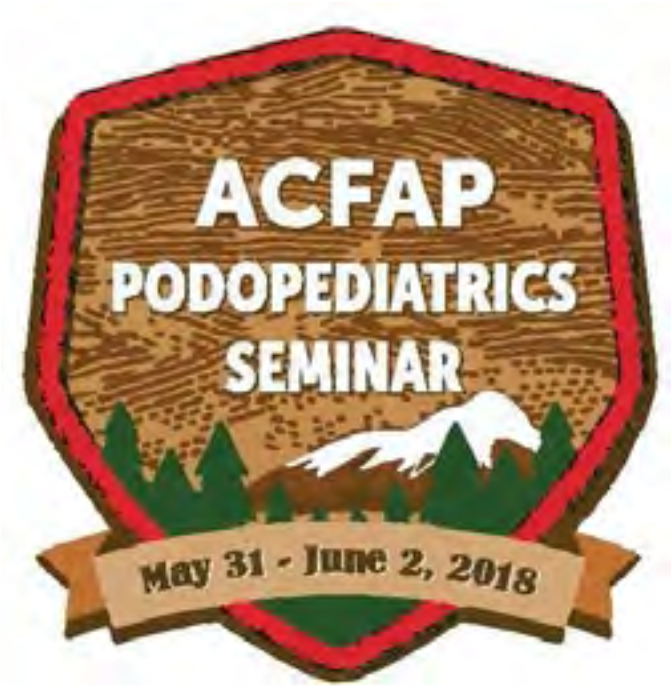

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